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The Eucalypt Ash Resource of West Gippsland

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Abstract: The paper describes the natural occurrence and characteristics of the ash type eucalypts of West Gippsland. The effects of settlement, fire and utilization on the original resource are discussed.

Measures being taken by the Forests Commission of Victoria to conserve and increase the resource are outlined. These include the regeneration of logged areas, the reforestation of previous ash areas now carrying bracken and scrub, the thinning of regrowth stands, and intensified fire protection.

The future use and value of the ash resource is discussed.

INTRODUCTION

The name 'ash' was applied to a small group of eucalypts in the early days of settlement of Australia, because of a superficial resemblance of the timber to that of the European ash (*Fraxinus* spp).

In Victoria the ash type eucalypts are confined to the cool high rainfall areas of the Central and Eastern Highlands, and the Otway and South Gippsland Ranges. The total State Forest area in Victoria is about 14,500,000 acres, and only 636,000 acres of this is classified as ash type country. Despite their limited distribution the ash species are of major importance in Victorian forestry.

OCCURRENCE OF ASH SPECIES IN WEST GIPPSLAND

For the purpose of this paper West Gippsland is considered as the area covered by the Dandenong, Neerim, Erica, Yarram and Mirboo Forest Districts. This area coincides approximately with the West Gippsland Region, and was used in compiling the forest statistics for the Regional Resources Survey.

Ash group species occurring naturally in West Gippsland are mountain ash (*Eucalyptus regnans*, F. Muell.), alpine ash (*E. delegatensis*, R. J. Baker), and shining gum (*E. nitens*, Maiden). They are all found in the Central Highlands in the headwaters of the Bunyip, Tarago, Latrobe, Toorongo, Tanjil, Thomson and Aberfeldy Rivers, but only mountain ash occurs in the South Gippsland Ranges, which have a maximum height of some 2,200 ft above sea level. Fig. I shows the distribution of the ash resource in West Gippsland.

Of the 950,000 acres of State Forest in West Gippsland about 167,000 acres is classified as ash country. Much of this is steep and broken, with generally deep moist fertile soils. The predominant rock formations are the granitic northern highlands with Cretaceous mudstones and shales in South Gippsland.

The ash zone extends from about 1,500-4,000 ft above sea level, with extremes down to 600 ft and up to about 4,500 ft. The best forest development is on the cooler and moister southern slopes. Below the ash zone eucalypts of the selerophyllous stringybark-peppermint-gum type take over whilst at higher levels in the alpine zone, a sparser tree vegetation merges into high-plain grassland swamps and rocky outcrops (Ferguson 1965).

ASH TYPE FOREST DESCRIPTION

The ash species occur mainly in even-aged stands of one species only. Mountain ash reaches its best development between 1,500 and 3,500 ft above sea level, but extends down to some 600 ft on sheltered sites. At its upper limits it is replaced by alpine ash, found mainly between 3,000 and 4,500 ft but reaching a maximum altitude of around 5,000 ft. Shining gum also occurs at the higher levels.

At the lower elevations the undergrowth is hygrophyllous in character and very luxuriant. Larger shrubs and trees such as blackwood (*Aca-*

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FIG. 1

cia melanoxylon, R. Br.), myrtle beech (*Nothofagus cunninghamii*, Hook (Oerst)), and sassafras (*Atherosperma moschatum*, Labill) frequently form the second storey, to a dense lower storey of tree ferns and moisture loving shrubs. Towards the upper reaches, particularly in the alpine ash areas, the undergrowth is much sparser.

SPECIES CHARACTERISTICS

Trees of the ash species, and particularly mountain ash, grow to great heights, although of comparatively slender girths. Hardy (1921) lists a number of mountain ash trees well over 300 ft high, including 342 ft to a broken top in the Dandenongs, 319 ft in the Otways, and 326 ft at Mt. Baw Baw. However these trees are no longer standing, and possibly there are no trees left in West Gippsland exceeding 300 ft.

The ash species grow rapidly, and typical heights for mountain ash on better sites are 35 ft at 4 years old, 59 ft at 10 years. Some of the faster growing trees of the regrowth from the 1939 fires are now around 160 ft high. Well-stocked mountain ash stands on favourable sites will grow at the rate of more than 300 cu. ft per acre annually, and more than 20,000 cu. ft per acre in mill logs has been harvested from some of the older original stands.

Unlike the majority of the eucalypts, the ash species do not develop ligno-tubers, and mountain ash and alpine ash do not coppice. The species are readily killed by fires, but provided adequate seed is available on the trees, fires will normally produce excellent natural regeneration. However repeated fires at short intervals can wipe out ash stands, by killing the regeneration before it is old enough to carry viable seed.

Often tens of thousands of seedlings per acre

result from fires, but natural thinning rapidly reduces these heavy initial stockings. Britton (1954) states that a stocking of about 1,140 trees per acre at age 10 years will reduce to 485 at 20, 290 at 30, and 150 at 50 years.

HISTORY OF THE ASH FORESTS

The original extensive ash stands of West Gippsland have been changed considerably by settlement, fires and utilization.

1. Settlement

From 1880 to about 1900 extensive mountain ash areas north of Noojee and in the Strzelecki Ranges of South Gippsland were sub-divided and made available for settlement. In an astonishingly short time tens of thousands of acres were cleared: the timber was considered a nuisance by the settlers and destroyed, generally by burning. Much of this ash country was later abandoned since problems of scrub, vermin, difficult topography, fire and isolation proved too much for the pioneers.

Limited areas of these abandoned blocks now carry mountain ash regrowth resulting from clearing fires or wild fires, but in general the vegetation ranges from bracken (*Pteridium esculentum*, Forest.f.) and low scrub to stands of wattles up to 50 ft in height and with diameters 9 inches or more. The wattles generally form a dominant overstorey, with lesser scrub species below the main canopy. The most common are silver wattle (*Acacia dealbata*, Link) and hickory wattle (*Acacia obliquinervia*, M. D. Tindale) with blackwood (*Acacia melanoxylon*, R. Br.) in the gullies. In the South Gippsland Ranges blackberries (*Rubus* spp.) are widespread.

Some of these abandoned blocks reverted to the ownership of the Crown, and since the 1930s the Forests Commission has been purchasing blocks which remained freehold. To date tens of thousands of acres, which should never have been made available for selection, have been acquired.

2. Fires

Over the years bush fires have caused tremendous losses in the ash forests of West Gippsland. These include Black Thursday in 1851 and the big fires of 1898, 1926 and 1932, and culminate in the catastrophe of January 1939 when 71 lives were lost, townships obliterated, and throughout Victoria 3½ million acres of State Forest destroyed or damaged. 'For mile upon mile the former forest monarchs were lain in confusion, burnt, torn from the earth, and piled one upon another as matches strewn by a giant hand'. (Royal Commissioner in Report of Royal Commission, 1939).

The earlier fires produced some extensive areas of excellent ash regeneration, but most of these were destroyed by the 1939 fires. In their turn the 1939 fires resulted in some 96,000 acres of ash regeneration in West Gippsland, but left only about 17,000 acres of green ash forest in the region.

3. Utilization

From the early days of settlement ash timbers were eagerly sought for palings and shingles because they split so readily, and many of the original giants fell to the axes of the paling splitters. Despite their ease of working and sawing they were not in great demand for milling, because of the tendency of the sawn timber to collapse and distort during drying and seasoning. Milling was concentrated in the slower-growing, more durable, species of the foothill forests.

Following advances in seasoning techniques from about 1910 onwards, and the development of a process for the 'reconditioning' of collapsed ash timber, the success of kiln-seasoned ash was assured (Galbraith 1937). Reconditioning consists of steam heating the partially dried timber, and this restores the original shape and removes all stresses.

Large scale milling of ash forests commenced in the Warburton area, and extended in the early twenties to the mountain ash forests north of Noojee and Erica. Because of their attractive appearance, light colour, and freedom from gum veins and other blemishes ash timbers became widely used for furniture and cabinet work, joinery, flooring, and weatherboards.

The ash mills and associated settlements were mainly located in the forests, with supplies brought in and timber carted out over tramways. These ranged from wooden lines and horse-drawn trucks to more elaborate steel tramlines with steam locomotives. Logging of the huge trees in the difficult country was beyond the ability of the horses and bullocks previously used, and large stationary steam winches were introduced.

These logging operations left large quantities of lower quality material considered useless for sawing. Following an investigation by the Forests Commission of the quantities of timber suitable for pulpwood available from these residues and other sources, in 1936 the firm of Australian Paper Manufacturers Ltd. decided to build a chemical pulp mill at Maryvale, near Traralgon. The first deliveries of pulpwood to the mill were made in October 1937.

The ash timbers have a number of desirable properties for the production of wood pulp. For hardwoods their fibres are comparatively long, and a favourable length/diameter ratio in the fibres results in the production of strong, opaque

paper. The light colour of the wood lessens the costs of pulping and of bleaching. In comparison with softwoods they give a comparatively high yield of pulp.

By the late 1930s the sawmills had almost cut out the more accessible areas of mature mountain ash, and the Forests Commission and the timber industry started to build roads into hitherto inaccessible ash areas, including the Toorongo Plateau and the Eastern and Western Tanjil Valleys. The building of roads, instead of tramlines, was made possible by the use of the newly introduced crawler tractors.

This work was soon interrupted by the disastrous 1939 fires. The Forests Commission immediately initiated action to minimise the loss of fire-killed timber: the main measures were the acceleration of milling operations, transfer of these operations from the remaining green timber to fire-killed stands, and the felling and preservation for later milling of timber which could not be utilized quickly.

Despite the problems created by the 1939-45 war the main aims of this salvage scheme were achieved. At the height of operations in 1946/47, more than 6 million cubic feet of fire-killed ash logs were cut in West Gippsland, and large quantities of lower grade timber were supplied to the pulpwood mill at Maryvale. In addition to its advantages for road building, the crawler tractor was of tremendous assistance in logging the fire-killed stands, since it provided much greater flexibility than the winches.

Because of the progressive degrade of the fire-killed timber and the increasing damage to the 1939 fire regeneration, logging of the dead timber was discontinued in the early 50s. This followed a Forests Commission decision that future sawmills should be located in centres of population outside the forest. Hence this period saw a considerable drop in the number of bush mills.

As the supplies of fire-killed timber cut out, the limited green ash stands left in West Gippsland were unable to keep all the mills going, and some moved further east into the green, predominantly alpine ash areas.

By 1967/68 the West Gippsland ash sawlog output was only some 700,000 cu. ft, and in 1968/69 this fell to 600,000 cu. ft, with the main logging areas in the eastern Strzeleckis and the head of the Aberfeldy River. The eastern Strzeleckis timber is mainly small patches of mountain ash about 60 years old resulting from early attempts at settlement, and the Aberfeldy River timber is a previously untouched area of mainly alpine ash near the Great Dividing Range.

The ash pulpwood output from West Gippsland State Forest in 1968/69 was 1,900,000 cu. ft, mainly from logging residues, plus a limited volume from clearing for plantation establishment and from thinning in 1939 regrowth stands.

PRESENT CONDITION OF ASH TYPE STANDS

The following table sets out the present extent of the various types of vegetation on the ash State Forest areas of West Gippsland.

	acres
Virgin ash stands	2,500
Pre 1939 ash regrowth stands	6,000
1939 ash regrowth stands	96,000
Green ash stands logged since 1939	8,500
Ash plantations	6,000
Scrub and bracken areas	48,000
Total	167,000

About 50% of the 96,000 acres of 1939 regrowth is mountain ash, and this West Gippsland regrowth is part of a State total of 278,000 acres of ash regrowth resulting from the 1939 fires.

The numerous fires up to 1939 hindered until the early 1950s recognition of the general failure of logged ash stands to regenerate satisfactorily in the absence of fire, and over 5,000 acres of the green ash logged since 1939 is poorly regenerated.

FOREST MANAGEMENT POLICY

The Forests Commission's basic aim is to secure for the community maximum benefits from land reserved for forestry purposes. The primary objective is to develop the forest resources to produce the maximum volume of high quality timber, but management caters for water conservation and other legitimate uses of forest land in conjunction with timber production (Ferguson 1965).

Because of their fast growth and high quality timber the ash forests are of major importance in the achievement of maximum timber values. The ash areas near Melbourne, including those in West Gippsland, are of particular economic value because log royalties are higher the nearer the site to Melbourne, and all the West Gippsland ash is within the zone of economic pulpwood supply for the Maryvale mill.

Forests Commission activities aimed at obtaining increased timber benefits from the West Gippsland ash forests are 1. Regeneration of areas as they are felled for timber production. 2. Reforestation of scrub and bracken areas. 3. Thinning of regrowth stands. 4. Protection from fire and other destructive agencies.

1. Regeneration of Felled Areas

Following the realization in the early 1950s that many logged ash stands were not regenerating satisfactorily, research work by Ashton (1956), Grose (1957), and Cunningham (1960) defined the main requirements for successful seedling establishment as a receptive seed-bed which favours germination and promotes rapid early growth, and an adequate seed supply.

Techniques developed to satisfy these requirements are being used to regenerate the area of some 300 acres of ash forest clear-felled annually in West Gippsland.

Although on the more exposed aspects the soil disturbance from logging may produce an acceptable seed-bed, where possible the seed-bed is made highly receptive by the autumn burning of the heads and other debris from the logging. This is found to improve germination, and rapid growth of seedlings with better survival.

The burning of the debris requires sound planning and a good knowledge of fire behaviour, if the objectives are to be achieved without unacceptable damage to adjoining forest areas. Utilization must be organized to produce cut-over areas with suitable characteristics for burning, and there is only a relatively short period when satisfactory safe burns can be carried out.

The efficiency of the seed-bed decreases rapidly, and the seed should be supplied as soon as possible after the bed has been prepared. The relatively small areas being logged in West Gippsland are normally hand sown, at the rate of about 50,000 viable seeds per acre for alpine ash sites, and 90,000 per acre for mountain ash, with the aim of establishing some 1,000 well distributed seedlings per acre. This sowing rate is equivalent to about 1–1½ lbs of seed per acre, depending on the percentage of viable seeds.

Before sowing the seeds are coated with clay to give a larger sized particle which results in more even distribution, and an insecticide and fungicide are included in the coating. Harvesting by insects can result in significant losses if the seed is not treated. The coated seeds are dyed yellow to facilitate ground checks of particle dispersion.

For large areas aerial sowing is cheaper and much quicker than hand sowing, and so is widely used in the more extensive regeneration operations in East Gippsland.

Techniques have been developed for the economic collection of the comparatively large quantities of seed required by artificial sowing. Direct costs for the collection of alpine ash seed are now about \$4–\$6 per pound, and for mountain ash from \$7–\$9 per pound. Shining gum seed is rarely available in quantity and is comparatively costly to collect. The size of the area and local factors can result in wide variations in the cost of artificial sowing, but typical costs, including burning and seed collection, are around \$11-\$17 per acre.

When necessary, browsing animals are controlled by baiting with carrots treated with 1080 poison.

In general the use of deliberately retained trees as a seed source has been abandoned as unsatisfactory. Difficulties include the irregularity of good seed trees, limited natural seed fall, and the hazard of inducing the shedding of seed when the seed-bed is most 'receptive'. Also the retention of merchantable trees as a seed source can result in a substantial loss of royalty.

2. Reforestation of Scrub and Bracken Areas

The difficulties of preparing a satisfactory seed-bed limit the use of direct seeding on these areas, and in general in West Gippsland they are being planted with seedlings.

Forests Commission planting started in 1940 on areas north of Noojee, but the bulk of recent work has been in the eastern Strzelecki. The total area established to date is some 6,000 acres, virtually all mountain ash, and planting is proceeding at the rate of about 750 acres per year. In the eastern Strzelecki use is being made of prison labour from two penal camps.

A.P.M. Forests Pty. Ltd. (a subsidiary of Australian Paper Manufacturers Ltd.) is also carrying out large-scale mountain ash planting in the eastern Strzelecki, with about 6,000 acres established to date. Part of this planting is on State Reserved Forest over which the Company has been granted a long term lease.

To allow access for planting and to reduce early competition with the plants, the scrub is first removed or greatly reduced. As far as possible this is done with tractors, although on the steeper country the scrub must be hand-felled and burned. The dense wattle stands present a special problem, because in general the trees have no merchantable value, and if they are felled when green a tremendous volume of debris is produced. The Forests Commission's present procedure is to clear planting strips through them, and to ringbark the wattles in between these strips.

Experimental work is being carried out on aerial spraying of the dense wattle stands with herbicides, mainly the butyl ester of 245T in fuel oil. Results to date are promising, as once trees

have been defoliated it is mueh easier to handle the remaining dead material.

Unlike pines, open-rooted ash stock are very difficult to plant out, and the plants are raised in individual small eontainers. At the age of about 9 months and some 9 in. to 12 in. high, the seedlings are planted out in the winter and early spring at the rate of about 600–700 plants per aere. Beeause of the limited number of trees planted per acre effective eontrol of animals whieh attaek the young trees is essential, and this is aehieved by the use of aerial poisoning with earrots treated with the poison 1080. Fertilizers are being used to stimulate the early growth of the plants, with the aim of minimising effects of eompetition from the quickly returning scrub, and redueing vermin damage.

Although of proven effectiveness and requiring only limited quantities of seed, planting is costly and presents problems on the higher eountry where the winter weather is often unsuitable for work. Researeh is being carried out on possible methods of reforesting scrub and bracken areas by direet seeding, and under some eonditions soil cultivation has produced a satisfaetory seed bed.

Direct seeding would give greater flexibility sinee aerial sowing eould be used. This would be much eheaper, as experienee to date indicates costs for this sowing could be in the order of $55 per acre as against $90 per acre for planting. However the seed requirements would be some 30 times that for planting.

Although it may not be praetieal to reforest all the serub and bracken areas, obviously the present reforestation rate of about 750 acres per annum is undesirably low. Commonwealth Government finaneial assistance, on the same lines as has been provided for the softwood planting programme, is being sought, with the aim of inereasing the annual ash reforestation programme within 100 miles of Melbourne to 5,000 acres per annum. Of this about 2,500 aeres per annum would be in West Gippsland.

3. Thinning of Regrowth Stands

Ash regrowth stands are being thinned eommereially at the rate of about 100 aeres annually, with some 400 acres treated to date. The main produet is pulpwood. The poorer trees are removed, with the aim of inereasing the growth rate of the better quality retained trees and redueing the time required to produce high quality saw logs.

On the basis of present techniques it is doubtful whether this operation can be greatly expanded, because it must be restrieted to the easier topography to avoid damage to the retained trees and high produetion costs.

4. Forest Protection

Destructive fires have been part of the history of the ash forests, and if considered an inevitable part this situation would seem to make a substantial expenditure on improving these forests a doubtful investment.

Complete freedom from fires is impossible, but fire proteetion advanees since 1939 have greatly redueed the risk of large-seale damage. The devastating fires of the past started in the dry foothill forests on the western and northern fringes of the ash forests. Hundreds of miles of roads and tracks have been built in this marginal eountry and men and equipment can be moved quickly to any outbreaks. Fuel-reduetion burning is used with the aim of keeping ground fuel down to a safe level.

Lookout towers have been established, and when neeessary aircraft are used to supplement these towers on fire spotting. Helipads have been built in the more remote areas so that men can be moved in rapidly by helicopter.

Dams for storing water have been built, wireless eommunieations installed, and major items of fire fighting equipment sueh as 'dozers, tankers and other types of vehicles are readily available.

Of reeent coneern is the defoliation of some mountain ash regrowth stands in the headwaters of the Tarago and Bunyip Rivers by a phasmatid —*Didymuria violescens*. This is a native stick inseet whieh oeeurs widely throughout the northeast of Victoria, and aerial spraying with malathion is being used as a eontrol measure.

FUTURE OF THE ASH FORESTS OF WEST GIPPSLAND

These forests will become of increasing importance in helping to meet the wood requirements of the Region and the State. The Region's present total ash timber output of about 2½ million cu. ft annually is considerably less than the estimated total annual increment for the regrowth and planted ash stands, which is about 20 million cu. ft.

This low output is due to the limited volumes of timber available from the dwindling resource of virgin stands and older regrowth stands, and not to lack of demand. In faet there is an increasing demand for ash saw-logs and ash pulpwood.

The sawmillers of the region cut about 3 million eu. ft of mixed speeies logs from foothill forests in 1968/69, and as this resource is beeoming exhausted the industry is looking to the ash forests for future supplies. Also the Maryvale pulp mill, whieh used 6 million eu. ft of ash pulpwood in 1968/69, is seeking increased supplies, particularly of regrowth ash.

The remaining virgin stands and older regrowth stands will be felled over the next decade, and clear-felling in the 1939 regrowth will be necessary if the demands for supplies are to be met. An early start on fellings will fit in with 'rotations' of around an average of 60 years for mountain ash, and 80 years for the slower growing alpine ash and shining gum.

The original stands logged for milling were at least 100 years old, and often considerably more, but the proposed shorter rotations will make the economics of ash plantations more attractive, produce logs of more convenient size, and reduce losses from decay.

On the basis of the present planting plan and spreading the cut over 60 years, clear-fellings in the 1939 regrowth could be commenced in about 10 years at an annual rate of 1,800 acres. This could be increased to 2,200 acres if the proposed expanded reforestation programme is undertaken.

Clear-felling of 1,800 acres annually at the age of 40 years should produce some 4 million cu. ft of saw-logs and a somewhat larger quantity of pulpwood, increasing to about 7 million cu. ft of saw logs plus a similar quantity of pulpwood when fellings are in 60 year old stands. The efficient utilization of these saw-logs will require improved conversion equipment and techniques, and much larger mills than those now operating in the Region.

An indication of the industrial activity which will result from the utilization of the timber from the regrowth stands is that, on the basis of current prices, the green sawn timber and wood pulp produced will have a value in the order of $10,000,000 annually at the 'ex-mill' stage.

The ash forests provide the vegetative cover for the upper reaches of a number of important domestic and industrial water supply catchments in West Gippsland, including the Bunyip and Tarago Rivers, the Latrobe River and its tributaries, the Thomson River and several short streams which rise in the eastern Strzeleckis and flow to the sea.

Forest operations in these catchments will continue to be organized, controlled and conducted in such manner as will adequately protect water supply interests.

In accordance with Forests Commission policy of multiple use of forest lands, future management of the ash forests of West Gippsland will cater for public recreation and tourism. These spectacular forests are located near concentrations of population in Melbourne and the Latrobe Valley, and public and Forests Commission roads provide ready access.

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